

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Seiichi MIYAZAKI

Application No.: U.S. National Stage of PCT/JP00/09185

Filed: August 15, 2001

Docket No.: 110386

For: ETCHANT, ETCHING METHOD AND SEMICONDUCTOR SILICON WAFER

PRELIMINARY AMENDMENTDirector of the U.S. Patent and Trademark Office
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claims 1-20 without prejudice to or disclaimer of the subject matter contained therein.

Please add new claims 21-42 as follows:

- 21. An etchant of a semiconductor material, being prepared by immersing stainless steel in an alkali aqueous solution for not less than 10 hours. --
- 22. The etchant as claimed in claim 21, wherein the alkali is sodium hydroxide. --
- 23. The etchant as claimed in claim 21, wherein the stainless steel is one of SUS304 and SUS316. --
- 24. The etchant as claimed in claim 21, wherein a temperature of the alkali aqueous solution is between 70°C and 90°C. --

- 25. The etchant as claimed in claim 21, wherein a temperature of the alkali aqueous solution is between 80°C and 87°C. --
- 26. The etchant as claimed in claim 21, wherein a concentration of the alkali is between 40% and 60% in mass basis. --
- 27. The etchant as claimed in claim 21, wherein a concentration of the alkali is between 45% and 55% in mass basis. --
- 28. The etchant as claimed in claim 21, wherein a surface area of the stainless steel is not less than 20 cm² per a volume of 1 liter of the alkali aqueous solution. --
- 29. The etchant as claimed in claim 21, wherein a reducing agent having lower oxidation potential compared with an oxidation-reduction potential of a metal ion existing in the alkali aqueous solution, is dissolved in the alkali aqueous solution. --
- 30. The etchant as claimed in claim 29, wherein the reducing agent is one kind or not less than two kinds selected from the group consisting of dithionite, hypophosphite, boron hydride compound, aldehyde genera, and hydrazine compound. --
- 31. The etchant as claimed in claim 30, wherein the dithionite is sodium dithionite. --
- 32. The etchant as claimed in claim 31, wherein an amount of addition of the dithionite is not less than 2.5g/liter. --
- 33. The etchant as claimed in claim 21, in which silicon is dissolved. --
- 34. The etchant as claimed in claim 33, wherein an amount of dissolution of the silicon is not less than 2g/liter. --
- 35. The etchant as claimed in claim 21, wherein the etchant is prepared by using an alkali resistant container. --
- 36. An etchant of a semiconductor material, in which a concentration of a heavy metal ion is not more than

$3 \times 10^{-6}\%$ in mass basis. --

-- 37. An etchant of a semiconductor material, in which any one of concentrations of iron ion, copper ion, nickel ion, and chromium ion, is not more than $5 \times 10^{-7}\%$ in mass basis. --

-- 38. An etching method comprising the step of etching a semiconductor silicon wafer by using an etchant prepared by immersing stainless steel in an alkali aqueous solution for not less than 10 hours. --

-- 39. An etching method comprising the step of etching a semiconductor silicon wafer by using an etchant, in which a concentration of a heavy metal ion is not more than $3 \times 10^{-6}\%$ in mass basis. --

-- 40. An etching method comprising the step of etching a semiconductor silicon wafer by using an etchant, in which any one of concentrations of iron ion, copper ion, nickel ion, and chromium ion, is not more than $5 \times 10^{-7}\%$ in mass basis. --

-- 41. A semiconductor silicon wafer, wherein an amount of adhesion of a heavy metal element on a surface after etching in an alkali aqueous solution is not more than 1×10^{10} atoms/cm². --

-- 42. The semiconductor silicon wafer as claimed in claim 39, wherein all of the amounts of adhesion of iron, nickel, chromium, and copper on the surface are not more than 5×10^8 atoms/cm². --

REMARKS

Claims 21-42 are pending. By this Preliminary Amendment, claims 1-20 are cancelled and claims 21-42 are added. Prompt and favorable examination on the merits is respectfully requested.

Respectfully submitted,



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JAO:TJP/cmm

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